

## KEAM 2025

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1. Two finite sets  $A$  and  $B$  have  $m$  and  $n$  elements, respectively. The total number of subsets of  $A$  is 48 more than the number of subsets of  $B$ . The values of  $m$  and  $n$ , respectively, are
- A) 6,3
  - B) 6,4
  - C) 5,6
  - D) 2,6
  - E) 7,1

**Correct Answer :** Option B

2. Let  $A$  and  $B$  be subsets of universal set  $U$  such that  $n(U) = 800, n(A) = 300, n(B) =$  and  $n(A \cap B)$ . Then the number of elements in the set  $A' \cap B'$  is
- A) 50
  - B) 100
  - C) 700
  - D) 400
  - E) 200

**Correct Answer:-Question Cancelled**

3. If  $f(x) = \frac{x}{x-1}$  then  $\frac{f(a)}{f(a+1)}$  is equal to
- A)  $f(a^2)$
  - B)  $f(-a)$
  - C)  $f(-a^2)$
  - D)  $f\left(\frac{1}{a}\right)$
  - E)  $f\left(\frac{1}{a^2}\right)$

**Correct Answer :** Option A

4. If  $f: R \rightarrow R$  satisfies the relation  $f(x+y) = f(x) + f(y), \forall x, y \in R$  and  $f(1) = 3$  then  $f(0) + f(1) + f(2) + f(3)$  is equal to
- A) 12
  - B) 14
  - C) 16
  - D) 18
  - E) 22

**Correct Answer :** Option D

5. If  $z = 2 + i, i^2 = -1$ , then the value of  $z^2 - 4z + 15$
- A) 2
  - B) 6
  - C) 15
  - D) 12
  - E) 10

**Correct Answer :** Option E

6. The modulus of the complex number  $\left(\frac{i-2}{2-i}\right)$  is equal to
- A)  $\frac{2}{5}$
  - B)  $\frac{5}{4}$
  - C)  $\frac{2}{3}$
  - D)  $\frac{3}{2}$
  - E)  $\frac{5}{2}$

**Correct Answer :** Option E

7. If the complex number  $z$  varies so that the real and imaginary parts of  $z - 2 - 3i$  are equal, then the locus of  $z$  is
- A) a circle
  - B) a straight line
  - C) a parabola
  - D) an ellipse
  - E) a hyperbola

**Correct Answer :** Option B

8. If  $k = 4n + 3$ , where  $n$  is an integer and  $i^2 = -1$  then  $i^k$  is equal to
- A) 0
  - B) 1
  - C) -1
  - D)  $i$
  - E)  $-i$

**Correct Answer :** Option E

9. The sum of first three terms of a G.P. is 14 and the sum of next three terms is 112. Then 100<sup>th</sup> term of the G.P. is
- A)  $2^{99}$
  - B)  $2^{101}$

- C)  $2^{100}$
- D)  $2^{98} - 1$
- E)  $2^{99} + 1$

**Correct Answer :** Option C

- 10.** The product of first four terms of a G.P. is 324 and the product of first three terms of the G.P. is 216. Then the first term is
- A) 3
  - B) 6
  - C) 9
  - D) 16
  - E) 12

**Correct Answer :** Option E

- 11.** The product of first four terms of a G.P. is  $\frac{1}{1024}$ . Then the product of second and third terms is,
- A)  $\frac{1}{28}$
  - B)  $\frac{1}{16}$
  - C)  $\frac{1}{64}$
  - D)  $\frac{1}{32}$
  - E)  $\frac{1}{128}$

**Correct Answer :** Option D

- 12.** If the A.M. of  $a$  and  $c$  is 16 and if  $a = 8$ , then the G.M. of  $a$  and  $c$  is
- A)  $8\sqrt{3}$
  - B)  $6\sqrt{3}$
  - C)  $5\sqrt{3}$
  - D)  $4\sqrt{3}$
  - E)  $2\sqrt{3}$

**Correct Answer :** Option A

- 13.** If  ${}^n P_5 = 42^n P_3$  then  $n$  is equal to
- A) 3
  - B) 5
  - C) 7
  - D) 12
  - E) 10

**Correct Answer :** Option E

14. The number of arrangements of the letters of the word INDEPENDENCE such that the first letter is I and the last letter is P, is
- A) 12400
  - B) 12420
  - C) 12440
  - D) 12600
  - E) 12620

**Correct Answer :** Option D

15. If four coins are tossed, then the number of possible ways of getting 2 or 3 heads, is
- A) 12
  - B) 10
  - C) 8
  - D) 6
  - E) 4

**Correct Answer :** Option B

16. The value of  $\frac{{}^5C_r}{{}^6C_r}$  when the numerator and denominator take their greatest value, is
- A) 2
  - B)  $\frac{1}{2}$
  - C) 1
  - D)  $\frac{5}{6}$
  - E)  $\frac{6}{5}$

**Correct Answer :** Option B

17. If  $(1 + x - 2x^2)^6 = 1 + a_1x + a_2x^2 + \dots + a_{12}x^{12}$  then the sum  $a_2 + a_4 + a_6 + \dots + a_{12}$  has the value
- A) 31
  - B) 32
  - C) 33
  - D) 63
  - E) 64

**Correct Answer :** Option A

18. If  $A = \begin{bmatrix} 5 & 2 & x \\ y & 2 & -3 \\ 4 & t & -7 \end{bmatrix}$  is a symmetric matrix, then the values of  $x, y$  and  $t$ , respectively, are
- A) 4,2,3
  - B) 4,2,-3
  - C) 4,2,-7
  - D) 2,4,-7
  - E) 4,3,2

**Correct Answer :** Option B

**19.** If  $A = \begin{bmatrix} & 0 \\ 1 & 1 \end{bmatrix}$  and  $B = \begin{bmatrix} 16 & 0 \\ 5 & 1 \end{bmatrix}$  and if  $A^2 = B$  then the value  $X$  is equal to

- A) 2
- B) 3
- C) 4
- D) 5
- E) 6

**Correct Answer :** Option C

**20.** If  $\alpha + \beta + \gamma = 0$ , then  $\begin{vmatrix} e^\alpha & e^{2\alpha} & e^{3\alpha} - 1 \\ e^\beta & e^{2\beta} & e^{3\beta} - 1 \\ e^\gamma & e^{2\gamma} & e^{3\gamma} - 1 \end{vmatrix} =$

- A)  $e^{-1}$
- B)  $e$
- C)  $e^2$
- D)  $e^3$
- E) 0

**Correct Answer :** Option E

**21.** If the points  $(2,-3)$ ,  $(x,1)$  and  $(0,5)$  are collinear, then the value of  $x$  is

- A) 2
- B) -2
- C) -1
- D) 1
- E) 0

**Correct Answer :** Option D

**22.** If  $x$  satisfies the inequality  $\frac{x-3}{x-5} > 3$  then  $x$  lies in the interval

- A) (3,8)
- B) (0,5)
- C) (5,6)
- D)  $(-\infty, 3)$
- E) (5,8)

**Correct Answer :** Option C

**23.** The solution set of the inequation  $\left| \frac{1}{x} - 2 \right| < 4$  is

- A)  $\left(-\infty, \frac{-1}{2}\right) \cup \left(\frac{1}{6}, \infty\right)$
- B)  $\left(-\infty, \frac{-1}{2}\right)$
- C)  $\left(\frac{1}{6}, \infty\right)$
- D)  $\left(-\infty, \frac{1}{6}\right) \cup \left(\frac{1}{2}, \infty\right)$
- E)  $(-\infty, -\infty)$

**Correct Answer :** Option A

**24.** If  $\cos x = \frac{4}{5}$ , where  $x \in \left[0, \frac{\pi}{2}\right]$ , then the value of  $\cos\left(\frac{x}{2}\right)$  is equal to

- A)  $\frac{1}{\sqrt{10}}$
- B)  $\frac{-1}{\sqrt{10}}$
- C)  $\frac{3}{\sqrt{10}}$
- D)  $\frac{\sqrt{3}}{1}$
- E)  $\frac{-3}{\sqrt{10}}$

**Correct Answer :** Option C

**25.** The value of  $\sin \frac{5\pi}{12} \sin \frac{\pi}{12}$  is equal to

- A) 1
- B)  $\frac{1}{4}$
- C)  $\frac{1}{2}$
- D)  $\frac{\sqrt{3}}{2}$
- E) 0

**Correct Answer :** Option B

**26.**  $\frac{1 - \sin^6\theta - \cos^6\theta}{\cos^2 2\theta} =$

- A)  $\frac{1}{4} \tan^2 2\theta$
- B)  $\frac{1}{2} \tan^2 2\theta$
- C)  $\frac{3}{2} \tan^2 2\theta$
- D)  $\frac{3}{4} \tan^2 2\theta$
- E)  $\tan^2 2\theta$

**Correct Answer :** Option D

**27.** If  $\frac{\cos A}{\cos B} = \alpha$ , then  $\frac{\alpha + 1}{\alpha - 1}$  is equal to

- A)  $\cot\left(\frac{A+B}{2}\right)\cot\left(\frac{A-B}{2}\right)$
- B)  $-\cot\left(\frac{A+B}{2}\right)\tan\left(\frac{A-B}{2}\right)$
- C)  $-\tan\left(\frac{A+B}{2}\right)\cot\left(\frac{A-B}{2}\right)$
- D)  $-\cot\left(\frac{A+B}{2}\right)\cot\left(\frac{A-B}{2}\right)$
- E)  $-\cot\left(\frac{A+B}{2}\right)$

**Correct Answer :** Option D

**28.** If  $\tan^{-1}2x + \tan^{-1}3x = \frac{\pi}{4}$ , then the value of  $x$  is equal to

- A)  $\frac{1}{6}$
- B)  $\frac{1}{4}$
- C)  $\frac{1}{3}$
- D)  $\frac{1}{2}$
- E) 1

**Correct Answer :** Option A

**29.** The domain of the function  $f(x) = \cos^{-1}\left(\left[ x \right]\right)$  (where  $[x]$  denotes the greatest integer function) is

- A)  $[-1,2]$
- B)  $[-1,2)$
- C)  $(-2,2)$
- D)  $(-2,1)$
- E)  $(-1,1)$

**Correct Answer :** Option B

**30.** If  $\sin^{-1}\left(\frac{3\sin 2\alpha}{5+4\cos 2\alpha}\right) = \frac{\pi}{2}$ , then  $3\sin 2\alpha - 4\cos 2\alpha$  is equal to

- A) 3
- B) 6
- C) 4
- D) 1
- E) 5

**Correct Answer :** Option E

- 31.** If the angle between two lines is  $\frac{\pi}{4}$  and the slope of one of the lines is  $\frac{1}{2}$ , then the slope of other line is
- A)  $3$  or  $\frac{-1}{3}$
  - B)  $2$  or  $\frac{-1}{2}$
  - C)  $1$  or  $-1$
  - D)  $-3$  or  $2$
  - E)  $3$  or  $\frac{1}{2}$

**Correct Answer :** Option A

- 32.** If a straight line passes through the points  $(\frac{-1}{2}, 1)$  and  $(1, 2)$ , then its  $y$ -intercept is
- A)  $4$
  - B)  $3$
  - C)  $-4$
  - D)  $\frac{-4}{3}$
  - E)  $\frac{4}{3}$

**Correct Answer :** Option E

- 33.** If the base of an equilateral triangle is along the straight line  $2x - y = 1$  and the opposite vertex is  $(-1, 2)$ , then the length of the side of the triangle is
- A)  $\frac{20}{3}$  units
  - B)  $2\sqrt{\frac{5}{3}}$  units
  - C)  $\frac{\sqrt{20}}{3}$  units
  - D)  $\frac{2}{\sqrt{15}}$  units
  - E)  $\sqrt{\frac{3}{20}}$  units

**Correct Answer :** Option B

- 34.** A circle passes through  $(4, 0)$  and  $(0, 2)$  with centre on the  $y$ -axis. The radius of the circle is
- A)  $5$
  - B)  $10$
  - C)  $15$
  - D)  $20$
  - E)  $25$

**Correct Answer :** Option A

**35.** If the length of major axis of an ellipse is twice the length of minor axis, then its eccentricity is equal to

- A)  $\frac{\sqrt{2}}{3}$
- B)  $\frac{\sqrt{3}}{2}$
- C)  $\frac{1}{\sqrt{2}}$
- D)  $\frac{2}{3}$
- E)  $\frac{2\sqrt{2}}{3}$

**Correct Answer :** Option B

**36.** The lengths of the transverse axis and conjugate axis of the hyperbola  $\frac{x^2}{9} - \frac{y^2}{25} = 1$  respectively, are

- A) 3,5
- B) 4,5
- C) 6,10
- D) 9,25
- E) 6,5

**Correct Answer :** Option C

**37.** The equation of the directrix of the parabola  $(x - 1)^2 = 2(y - 2)$  is

- A)  $2y - 3 = 0$
- B)  $2y + 3 = 0$
- C)  $3y - 2 = 0$
- D)  $3y + 2 = 0$
- E)  $2x - 1 = 0$

**Correct Answer :** Option A

**38.** The vectors  $-\hat{i} + \frac{1}{4}\hat{j} + 2\hat{k}$  and  $\hat{i} + \frac{1}{4}\hat{j} + 2\hat{k}$ , are the adjacent sides of a parallelogram. The area of the parallelogram is

- A)  $\frac{\sqrt{65}}{4}$
- B)  $\sqrt{65}$
- C)  $\sqrt{\frac{65}{2}}$
- D)  $\frac{\sqrt{65}}{2}$
- E)  $\frac{\sqrt{65}}{3}$

Correct Answer : Option D

39. Let the vectors  $\vec{a}$  and  $\vec{b}$  be such that  $|\vec{a}| = 3$  and  $|\vec{b}| = \frac{\sqrt{2}}{3}$ . If  $\vec{a} \times \vec{b}$  is a unit vector, then the angle between  $\vec{a}$  and  $\vec{b}$
- A)  $\frac{\pi}{3}$
  - B)  $\frac{\pi}{4}$
  - C)  $\frac{\pi}{6}$
  - D)  $\frac{\pi}{2}$
  - E)  $\frac{3\pi}{4}$

Correct Answer:-Question Cancelled

40. The projection of the vector  $\vec{a} = 3\hat{i} - \hat{j} - 2\hat{k}$  on  $\vec{b} = \hat{i} + 2\hat{j} - 3\hat{k}$  is
- A)  $\frac{\sqrt{14}}{2}$
  - B)  $\frac{14}{\sqrt{2}}$
  - C)  $\sqrt{14}$
  - D)  $14\sqrt{2}$
  - E)  $2\sqrt{14}$

Correct Answer : Option A

41. If  $|\vec{a}| = 4$  and  $-1 \leq \lambda \leq 3$ , then  $|\lambda\vec{a}|$  lies in the interval
- A) [1,4]
  - B) [1,3]
  - C) [4,14]
  - D) (3,12)
  - E) [4,12]

Correct Answer:-Question Cancelled

42. Question42 :- The angle between the lines  $\vec{r} = (3\hat{i} + 2\hat{j} - 4\hat{k}) + \lambda(\hat{i} + 2\hat{j} + 2\hat{k})$  and  $\vec{r} = (5\hat{i} - 2\hat{j}) + \mu(3\hat{i} + 2\hat{j} + 6\hat{k})$  is
- A)  $\cos^{-1}\left(\frac{9}{13}\right)$
  - B)  $\cos^{-1}\left(\frac{3}{19}\right)$
  - C)  $\cos^{-1}\left(\frac{19}{21}\right)$
  - D)  $\cos^{-1}\left(\frac{13}{17}\right)$
  - E)  $\cos^{-1}\left(\frac{3}{17}\right)$

Correct Answer : Option C

43. The equation of line joining the points  $(-3,4,11)$  and  $(1,-2,7)$  is

- A)  $\frac{x+3}{2} = \frac{y-4}{3} = \frac{z-11}{4}$   
B)  $\frac{x+3}{-2} = \frac{y-4}{3} = \frac{z-11}{2}$   
C)  $\frac{x+3}{-2} = \frac{y+4}{3} = \frac{z+11}{4}$   
D)  $\frac{x+3}{2} = \frac{y+4}{-3} = \frac{z+11}{2}$   
E)  $\frac{x+3}{-2} = \frac{y-4}{-3} = \frac{z-11}{-4}$

Correct Answer : Option B

44. The lines  $\frac{x-1}{2} = \frac{y+1}{-3} = \frac{z+10}{8}$  and  $\frac{x-4}{1} = \frac{y+3}{k} = \frac{z+1}{7}$  are coplanar. Then the value of  $k$  is

- A) 0  
B) -2  
C) 2  
D) 4  
E) -4

Correct Answer : Option E

45. Which one of the following points lies on the line  $\vec{r} = (\hat{i} + 2\hat{j} - 3\hat{k}) + t(4\hat{i} + 5\hat{j} - 7\hat{k}), t \in \mathbb{R}$ ?

- A)  $(9,12,-15)$   
B)  $(9,15,12)$   
C)  $(12,9,-17)$   
D)  $(9,12,-17)$   
E)  $(-9,-12,17)$

Correct Answer : Option D

46. If the mean of  $12 + x$ ,  $17 + x$ ,  $25 + x$ ,  $34 + x$  is 22 then the mean of  $38 + x$ ,  $42 + x$ ,  $52 + x$ ,  $60 + x$  is

- A) 42  
B) 22  
C) 48  
D) 46  
E) 50

Correct Answer : Option C

47. The standard deviation of 3, 8, 6, 10, 12, 9, 11, 10, 12, 7 is 2.71. The standard deviation of 30, 80, 60, 100, 120, 90, 110, 100, 120, 70 is

- A) 2.17  
B) 0.271

- C) 27.1
- D) 271
- E)  $2.71\sqrt{10}$

**Correct Answer :** Option C

48. If  $A$  and  $B$  are mutually exclusive events and  $P(B) = \frac{1}{5}$ ,  $P(A \cup B) = \frac{13}{35}$ , then  $P(A)$  is equal to
- A)  $\frac{1}{35}$
  - B)  $\frac{3}{35}$
  - C)  $\frac{1}{7}$
  - D)  $\frac{6}{35}$
  - E)  $\frac{1}{5}$

**Correct Answer :** Option D

49. If  $A$  and  $B$  are two independent events and  $P(A') = 0.8$ ,  $P(B) = 0.6$ , then  $P(A \cup B)$  is equal to
- A) 0.86
  - B) 0.8
  - C) 0.68
  - D) 0.52
  - E) 0.48

**Correct Answer :** Option C

50.  $\lim_{x \rightarrow 1} \frac{(x + x^2 + x^3 + x^4 + x^5) - 5}{x - 1} =$
- A) 5
  - B) 12
  - C) 14
  - D) 0
  - E) 15

**Correct Answer :** Option E

51.  $\lim_{x \rightarrow 0} \frac{\sin 2x + 3x}{4x + \sin 6x} =$
- A) 1
  - B)  $\frac{1}{4}$
  - C)  $\frac{1}{2}$
  - D) 2
  - E) 3

**Correct Answer :** Option C

52. The domain of  $f(x) = \sqrt{|x| - 1} + \sqrt{4 - |x|}$  is
- A)  $[-4, -1] \cup (1, 4)$
  - B)  $(-4, -1) \cup (1, 4)$
  - C)  $[-4, -1]$
  - D)  $[-4, -1) \cup (1, 4)$
  - E)  $[-4, -1] \cup [1, 4]$

**Correct Answer :** Option E

53. The range of  $f(x) = \sin x + \cos x + 3$
- A)  $[-1 + \sqrt{3}, 1 + \sqrt{3}]$
  - B)  $[-\sqrt{2} + 3, \sqrt{2} + 3]$
  - C)  $[-\sqrt{3} + 3, 3 + \sqrt{3}]$
  - D)  $[-\sqrt{2} - 3, 2 + \sqrt{3}]$
  - E)  $[-2 + \sqrt{3}, 2 + \sqrt{3}]$

**Correct Answer :** Option B

54. If  $F(x) = -\sqrt{9 - x^2}$ , then  $\lim_{x \rightarrow 1} \frac{F(x) - F(1)}{x - 1}$  is equal to
- A)  $\frac{1}{2}$
  - B)  $\frac{1}{\sqrt{2}}$
  - C)  $\frac{-1}{2\sqrt{2}}$
  - D)  $\frac{1}{2\sqrt{2}}$
  - E) 1

**Correct Answer :** Option D

55. If  $\log_2 y = x$ , then  $\frac{dy}{dx}$  is equal to
- A)  $2^x \log_e 2$
  - B)  $2^x$
  - C)  $x^2$
  - D)  $2x$
  - E)  $\frac{2^x}{\log_e y}$

**Correct Answer :** Option A

56. The derivative of  $y = (x - 1)(2x - 1)(3 - x)(4 - x)$  at  $x = \frac{1}{2}$  is equal to

- A) 35
- B)  $\frac{-35}{4}$
- C)  $\frac{-35}{2}$
- D)  $\frac{35}{4}$
- E)  $\frac{35}{2}$

Correct Answer : Option B

57. If  $f(x) = |\cos x - \sin x|$ , then  $f'\left(\frac{\pi}{6}\right)$  is equal to

- A)  $\frac{-(\sqrt{3} + 1)}{2}$
- B)  $\frac{(\sqrt{3} + 1)}{2}$
- C)  $\frac{\sqrt{3}}{2}$
- D)  $\frac{2}{\sqrt{3}}$
- E)  $\frac{2}{\sqrt{3} + 1}$

Correct Answer : Option A

58. Let  $f: (0, \infty) \rightarrow R$  and  $F(x) = \int_0^x f(t)dt$ . If  $F(x) = x^2(1 + x)$ , then  $f(2)$  is equal to

- A) -4
- B) 4
- C) -16
- D) 16
- E) 12

Correct Answer : Option D

59. If  $f(x) = |x^2 - 1|$ , then  $f'\left(\frac{3}{2}\right)$  is equal to

- A) 3
- B) 1
- C) 4
- D)  $\frac{3}{2}$
- E) 2

Correct Answer : Option A

60. A critical point of the function  $f(x) = \frac{x^3}{3} + 3x^2 - 7x$ , is

- A)  $\left(1, \frac{-11}{3}\right)$
- B)  $(0,0)$
- C)  $\left(-1, \frac{29}{3}\right)$
- D)  $\left(2, \frac{2}{3}\right)$
- E)  $\left(-2, \frac{70}{3}\right)$

**Correct Answer :** Option A

61. The function  $f(x) = 2x^3 + 9x^2 + 12x - 1$  is decreasing in the interval is

- A)  $(-1,1)$
- B)  $(-3,1)$
- C)  $(-2,-1)$
- D)  $[-2,1]$
- E)  $(-1,3)$

**Correct Answer :** Option C

62. The radius of a right circular cylinder is increasing at the rate of 2 cm/s and its height is decreasing at the rate of 3 cm/s. The rate of change of volume when radius is 4 cm and height 6 cm, is (in  $\text{cm}^3/\text{s}$ )

- A)  $24\pi$
- B)  $28\pi$
- C)  $42\pi$
- D)  $44\pi$
- E)  $48\pi$

**Correct Answer :** Option E

63. The sum of two positive numbers is 12. If the sum of whose square is minimum, then the numbers are

- A) 3,9
- B) 4,8
- C) 5,7
- D) 6,6
- E) 2,10

**Correct Answer :** Option D

64.  $\int \frac{dx}{\sqrt{x} + \sqrt{x-2}}$  is equal to

- A)  $\frac{1}{2} \left( x^{3/2} - (x-1)^{3/2} \right) + C$
- B)  $\frac{1}{3} \left( x^{3/2} - (x-2)^{3/2} \right) + C$

- C)  $\frac{1}{3} \left( x^{2/3} - (1-x)^{2/3} \right) + C$   
 D)  $\frac{1}{2} \left( x^{2/3} - (1-x)^{2/3} \right) + C$   
 E)  $\frac{1}{3} \left( x^{2/3} - (x-2)^{2/3} \right) + C$

**Correct Answer :** Option B

65.  $\int \frac{dx}{\cos x \sqrt{2 \sin 2x}} =$

- A)  $\frac{1}{2} \sqrt{\tan x} + C$   
 B)  $\sqrt{\tan x} + C$   
 C)  $2\sqrt{\tan x} + C$   
 D)  $4\sqrt{\tan x} + C$   
 E)  $3\sqrt{\tan x} + C$

**Correct Answer :** Option B

66. If  $f'(x) = 3x^2 - \frac{2}{x^3}$  and  $f(1) = 0$ , then  $f(x) =$

- A)  $x^2 + \frac{1}{x^3} + 1$   
 B)  $x^3 + \frac{1}{x^2} + 1$   
 C)  $x^3 + \frac{1}{x^2} + 2$   
 D)  $x^3 + \frac{1}{x^2} - 2$   
 E)  $x^3 + \frac{1}{x^2} - 1$

**Correct Answer :** Option D

67.  $\int \left[ \frac{1}{\log x} - \frac{1}{(\log x)^2} \right] dx =$

- A)  $\log x + C$   
 B)  $x \log x + C$   
 C)  $\frac{\log x}{x} + C$   
 D)  $\frac{x}{\log x} + C$   
 E)  $x + \log x + C$

**Correct Answer :** Option D

68.  $\int \sqrt{x^2 + 2x + 3} dx =$

- A)  $(x+1)\sqrt{x^2+2x+3} + \log|(x+1)+\sqrt{x^2+2x+3}| + C$   
 B)  $\frac{x+1}{2}\sqrt{x^2+2x+3} - \log|(x+1)+\sqrt{x^2+2x+3}| + C$

- C)  $\frac{x+1}{2}\sqrt{x^2+2x+3} - \frac{1}{2}\log|(x+1) - \sqrt{x^2+2x+3}| + C$
- D)  $\frac{x+1}{2}\sqrt{x^2+2x+3} + \log|(x+1) + \sqrt{x^2+2x+3}| + C$
- E)  $\frac{x+1}{2}\sqrt{x^2+2x+3} + \frac{1}{2}\log|(x+1) - \sqrt{x^2+2x+3}| + C$

**Correct Answer :** Option D

69.  $\int_3^5 \frac{e^{(1+x^2)}}{e^{(1+x^2)} + e^{(1+(8-x)^2)}} dx =$

- A) 5
- B) 1
- C) 2
- D) 3
- E) 0

**Correct Answer :** Option B

70.  $\int_{-a}^a (x^3 + x \cos^2 2x + \tan^3 x + 3) dx =$

- A) 2a
- B) 3a
- C) 4a
- D) 6a
- E) a

**Correct Answer :** Option D

71. The area bounded by the curve  $y = 3x - x^2$  and the  $x$ -axis is

- A)  $\frac{21}{2}$  sq.units
- B) 18 sq.units
- C)  $\frac{27}{2}$  sq.units
- D) 9 sq.units
- E)  $\frac{9}{2}$  sq.units

**Correct Answer :** Option E

72. Area of the region bounded by  $y = |x|$  and  $x = 4$  is

- A) 4 sq.units
- B) 6 sq.units
- C) 8 sq.units
- D) 12 sq.units
- E) 13 sq.units

**Correct Answer :** Option C

73. The order and degree of differential equation  $\sqrt[5]{1 + \frac{d^2y}{dx^2}} = \sqrt[4]{\left(y + \left(\frac{dy}{dx}\right)^5\right)}$ , respectively, are

- A) 2,5
- B) 2,4
- C) 2,3
- D) 4,5
- E) 4,4

Correct Answer : Option B

74. The order and degree of differential equation  $x \frac{dy}{dx} + y = e^x$  is

- A)  $y = \frac{e^x}{x} + Cx$
- B)  $y = xe^x + Cx$
- C)  $y = \frac{e^x}{x} + C$
- D)  $y = \frac{e^x}{x} + \frac{C}{x}$
- E)  $y = \frac{1}{x} + Cxe^x$

Correct Answer:-Question Cancelled

75. Let  $z = ax + by$ , where  $a, b > 0$ . The corner points of the feasible region determined by the system of linear constraints are  $(0, 10)$ ,  $(5, 5)$ ,  $(15, 15)$ ,  $(0, 20)$ . Condition on  $a$  and  $b$  so that the minimum of  $z$  occurs at both the points  $(15, 15)$  and  $(0, 20)$ , is

- A)  $a = b$
- B)  $2a = b$
- C)  $a = 2b$
- D)  $3a = b$
- E)  $a = 3b$

Correct Answer : Option D

76. A distance of 50 cm is measured using a metre stick with the smallest division 1 mm. The percentage error involved in the measurement is

- A) 2%
- B) 0.5%
- C) 0.2%
- D) 0.1%
- E) 5%

Correct Answer : Option C

77. The value of  $(200\text{ m} + 200\text{ mm})$  with regard to significant figures is

- A) 200.2 m
- B) 200 m
- C) 202 m
- D) 200.200 m
- E) 202.2 m

**Correct Answer :** Option B

**78.** The angle subtended by the vector  $\vec{A} = \hat{i} + \hat{j} + \hat{k}$  with the  $y$ -axis is

- A)  $\cos^{-1}\left(\frac{2}{\sqrt{3}}\right)$
- B)  $\sin^{-1}\left(\frac{1}{\sqrt{3}}\right)$
- C)  $\cos^{-1}\left(\frac{1}{\sqrt{3}}\right)$
- D)  $\sin^{-1}\left(\frac{2}{\sqrt{3}}\right)$
- E)  $\frac{\pi}{2}$

**Correct Answer :** Option C

**79.** When a body with its initial velocity non-zero, moves with constant retardation, the velocity-time graph is

- A) an oblique straight line with positive slope
- B) a straight line parallel to time axis
- C) a straight line parallel to velocity axis
- D) an oblique straight line with negative slope
- E) a curve with bend upwards

**Correct Answer :** Option D

**80.** If two bodies are projected with angles of projection  $\theta$  and  $(90 - \theta)$  with the same speed, then the ratio between their times of flight  $T_1$  and  $T_2$  is

- A)  $\cot \theta$
- B)  $\cos \theta$
- C)  $\sec \theta$
- D)  $\sin \theta$
- E)  $\tan \theta$

**Correct Answer :** Option E

**81.** A machine gun having mass 5 kg fires 40 gram bullet at the rate of 25 bullets per minute at a speed of  $300 \text{ ms}^{-1}$ . The force required to keep the gun in position is

- A) 7 N
- B) 4 N
- C) 2.5 N
- D) 10 N
- E) 5 N

**Correct Answer :** Option E

82. A force  $\vec{F} = \hat{i} + 2\hat{j} - 2\hat{k}$  applied on a body, accelerates the body with  $2 \text{ ms}^{-2}$ . Then the mass of the body is
- A) 0.5 kg
  - B) 10 kg
  - C) 5 kg
  - D) 1.5 kg
  - E) 7 kg

**Correct Answer :** Option D

83. A body moving with kinetic energy  $E$  is stopped by applying a stopping force  $F$ . The stopping distance is
- A)  $FE$
  - B)  $\frac{F}{E}$
  - C)  $\frac{E}{F}$
  - D)  $F^2E$
  - E)  $FE^2$

**Correct Answer :** Option C

84. The work done by the applied force in changing the elongation of a spring of spring constant  $K$ , from  $x_1$  to  $x_2$  is
- A)  $\frac{1}{2}K(x_2^2 - x_1^2)$
  - B)  $\frac{1}{2}Kx_1x_2$
  - C)  $\frac{1}{4}K(x_1^2 - x_2^2)$
  - D)  $\frac{1}{4}Kx_1x_2$
  - E)  $\frac{1}{2}K(x_1^2x_2^2)$

**Correct Answer :** Option A

85. In the uniform circular motion of a particle, the point about which the angular momentum of the particle is conserved is
- A) on the circumference of the circle
  - B) inside the circle
  - C) outside the circle
  - D) the centre of the circle
  - E) anywhere on the rotation axis

**Correct Answer :** Option D

86. A wheel of moment of inertia  $4 \times 10^{-3} \text{ kgm}^2$  rotates with an angular speed of  $25 \text{ rev. s}^{-1}$ . The torque (in  $\text{Nm}$ ) required to stop it in 10s is
- A)  $4\pi \times 10^{-4}$
  - B)  $2\pi \times 10^{-2}$

- C)  $6\pi \times 10^{-3}$
- D)  $\pi \times 10^{-1}$
- E)  $3\pi \times 10^{-5}$

**Correct Answer :** Option B

87. A force  $\vec{F}$  acting on a particle, having position vector  $\vec{r}$  exerts a torque  $\vec{\tau}$  about the origin on the particle. Then the angle between  $\vec{r}$  and  $\vec{\tau}$  is
- A)  $60^\circ$
  - B)  $45^\circ$
  - C)  $0^\circ$
  - D)  $90^\circ$
  - E)  $180^\circ$

**Correct Answer :** Option D

88. The gravitational potential energy between two bodies each of mass 1 kg kept at a distance of 1 m is (G - Gravitational constant)
- A)  $G$
  - B)  $-G$
  - C)  $\frac{-G}{2}$
  - D)  $\frac{G}{2}$
  - E)  $\frac{-G}{4}$

**Correct Answer :** Option B

89. If the acceleration due to gravity on the surface of a planet of mass  $m$  and radius  $r$  is  $g$ , then the escape velocity of a body from the surface of the planet is
- A)  $\sqrt{2gr}$
  - B)  $\sqrt{\frac{2g}{r}}$
  - C)  $\sqrt{gr}$
  - D)  $gr^2$
  - E)  $2gr^2$

**Correct Answer :** Option A

90. The wall between two thermal systems that allows the flow of heat from one to another to bring thermal equilibrium is called
- A) adiabatic wall
  - B) insulated wall
  - C) diathermic wall
  - D) semiconducting wall
  - E) non-conducting wall

**Correct Answer :** Option C

- 91.** If  $dV$  is the change in volume of a liquid of density  $\rho$  under the pressure  $P$ , then the pressure energy per unit mass of the liquid is
- A)  $PdV$
  - B)  $\frac{PdV}{\rho}$
  - C)  $\frac{PdV}{\rho^2}$
  - D)  $\frac{P}{\rho}$
  - E)  $P\rho$

**Correct Answer :** Option D

- 92.** If  $F_1$  is the force exerted by air on a small piston of area of cross-section  $A_1$  in a car lift, then the force  $F_2$  realised on the second piston of area of cross-section  $A_2$  due to the transfer of pressure is
- A)  $F_1 \frac{A_1}{A_2}$
  - B)  $F_1 \frac{A_2}{A_1}$
  - C)  $F_1 \sqrt{(A_1 A_2)}$
  - D)  $F_1 \sqrt{\frac{A_1}{A_2}}$
  - E)  $\sqrt{\frac{A_1}{A_2}}$

**Correct Answer :** Option B

- 93.** Find the mismatch pair in the thermodynamic process
- A) Isothermal : Absorption or emission of heat
  - B) Isobaric : Pressure constant
  - C) Isochoric : Volume constant
  - D) Irreversible : Loss of heat
  - E) Adiabatic : Heat exchange

**Correct Answer :** Option E

- 94.** In a Carnot engine if the ratio of the heat rejected to the sink to the heat absorbed from the source is 1 : 4, then the efficiency of the engine is
- A) 75 %
  - B) 60 %
  - C) 50 %
  - D) 25 %
  - E) 45 %

**Correct Answer :** Option A

95. The mean free path of a gas is directly proportional to its

- A) pressure
- B) density
- C) molecular diameter
- D) absolute temperature
- E) square of molecular diameter

**Correct Answer :** Option D

96. The condition for real gases to obey the ideal gas equation  $PV = RT$  is that the gases should be at

- A) high pressure
- B) low temperature
- C) low pressure and low temperature
- D) high pressure and low temperature
- E) low pressure and high temperature

**Correct Answer :** Option E

97. A particle is executing simple harmonic motion with  $A$  and  $B$  as its extreme positions and  $O$  as its mean position. If  $a$  and  $v$  represent the acceleration and velocity, then

- A) at  $A$ ,  $a = 0$
- B) at  $B$ ,  $a = 0$
- C) at  $O$ ,  $a$  is maximum
- D) at  $O$ ,  $a$  and  $v$  are maximum
- E) at  $O$ ,  $a = 0$

**Correct Answer :** Option E

98. The equation for the displacement  $x$  (in  $m$ ) of a particle executing simple harmonic motion in SI unit is  $x(t) = 5\cos 4\pi t$ . Its displacement after 3 s is

- A) 2 m
- B) 5 m
- C) 3 m
- D) 4 m
- E) 10 m

**Correct Answer :** Option B

99. Two sound sources produce 24 beats in 3 s. The difference between the two frequencies of the sources is

- A) 2
- B) 4
- C) 8
- D) 12
- E) 3

**Correct Answer :** Option C

- 100.** Electric potential due to an electric dipole on its axis at a distance  $r$  from its centre is inversely proportional to
- A)  $r$
  - B)  $r^3$
  - C)  $r^2$
  - D)  $r^{-2}$
  - E)  $r^{-1}$

**Correct Answer :** Option C

- 101.** If the potential difference between two conductors separated by a distance of 2 cm is  $4 \times 10^3$  V then the electric field between them (in  $Vm^{-1}$ ) is
- A)  $8 \times 10^3Vm^{-1}$
  - B)  $4 \times 10^5Vm^{-1}$
  - C)  $8 \times 10^5Vm^{-1}$
  - D)  $2 \times 10^3Vm^{-1}$
  - E)  $2 \times 10^5Vm^{-1}$

**Correct Answer :** Option E

- 102.** The electrostatic energy density of the electric field  $E$  in a capacitor is directly proportional to
- A)  $E^2$
  - B)  $E$
  - C)  $\sqrt{E}$
  - D)  $E^3$
  - E)  $E^{-2}$

**Correct Answer :** Option A

- 103.** In an electrolyte, the mobile charge carriers are
- A) electrons only
  - B) negative ions only
  - C) positive ions only
  - D) negative and positive ions
  - E) electrons and positive ions

**Correct Answer :** Option D

- 104.** If both the length and area of cross-section of a linear conductor are halved, its resistance would
- A) be doubled
  - B) remain unchanged
  - C) be halved
  - D) be tripled
  - E) be quadrupled

**Correct Answer :** Option B

- 105.** The power dissipated in the transmission cables of  $0.03 \Omega$  resistance, when 11 kW of power is transmitted at 220 V is
- A) 0.025 kW
  - B) 0.050 kW
  - C) 0.075 kW
  - D) 1.075 kW
  - E) 1.025 kW

**Correct Answer :** Option C

- 106.** If the horizontal and the vertical component of earth's magnetic field are, respectively,  $0.26 G$  and  $(0.26) \sqrt{3} G$ , then the dip angle is
- A)  $0^\circ$
  - B)  $30^\circ$
  - C)  $45^\circ$
  - D)  $60^\circ$
  - E)  $90^\circ$

**Correct Answer :** Option D

- 107.** The maximum torque experienced by a rectangular coil carrying a steady current  $I$  placed in a uniform magnetic field  $B$  is ( $l$ - length;  $A$  - area of cross-section)
- A)  $IBA$
  - B)  $IlB$
  - C)  $IBA^2$
  - D)  $IlB^2$
  - E)  $Il^2B$

**Correct Answer :** Option A

- 108.** In a television, the required magnetic field is produced by a/an
- A) toroid
  - B) electromagnet
  - C) permanent magnet
  - D) circular coil
  - E) solenoid

**Correct Answer:-Question Cancelled**

- 109.** If the flux linked with the coil of area of cross-section  $0.5 \text{ m}^2$  placed in a magnetic field of  $16 T$  is 4 Wb, then the angle between the magnetic field and the area vector of the coil is
- A)  $0^\circ$
  - B)  $30^\circ$
  - C)  $45^\circ$
  - D)  $60^\circ$
  - E)  $90^\circ$

**Correct Answer :** Option D

**110.** The self-inductance of a coil does not depend on

- A) its radius
- B) its number of turns
- C) its area of cross-section
- D) the current through it
- E) permeability of the medium

**Correct Answer :** Option D

**111.** Which one of the following proves the transverse nature of electromagnetic waves?

- A) Interference of light
- B) Dispersion of light
- C) Polarization of light
- D) Photoelectric effect
- E) Diffraction of light

**Correct Answer :** Option C

**112.** If the angle of a prism  $A$  is equal to the angle of minimum deviation, then the refractive index of the material of the prism is

- A)  $2\cos\frac{A}{2}$
- B)  $\cos\frac{A}{2}$
- C)  $2\cos A$
- D)  $\cos A$
- E)  $\sin\frac{A}{2}$

**Correct Answer :** Option A

**113.** According to Huygens Principle, a wavefront is

- A) a single ray of light
- B) a surface of constant phase
- C) a surface of varying phase
- D) a random arrangement of waves
- E) a region where crests and troughs overlap

**Correct Answer :** Option B

**114.** In Young's experiment, the wavelength of light is  $600\text{ nm}$ , the slit separation is  $0.5\text{ mm}$ , and the screen is  $2\text{ m}$  away. The fringe width of the interference pattern with the same set up becomes 3 times if the wavelength of light used is

- A) tripled
- B) doubled
- C) halved
- D) made one-third

E) made one-sixth

**Correct Answer :** Option A

**115.** If the frequency of the incident radiation  $f$  increases above the threshold frequency  $f_0$  of a photo-sensitive material, then the stopping potential

- A) increases linearly with  $f$
- B) decreases linearly with  $f$
- C) is independent of  $f$
- D) increases with intensity of light
- E) decreases with intensity of light

**Correct Answer :** Option A

**116.** The emission of electrons from a metal by applying a very strong electric field is called

- A) photoelectric emission
- B) field emission
- C) thermionic emission
- D) beta emission
- E) gamma emission

**Correct Answer :** Option B

**117.** The size of a nucleus is of the order of

- A)  $10^{-15}m$
- B)  $10^{-10}m$
- C)  $10^{-5}m$
- D)  $10^{-6}m$
- E)  $10^{10}m$

**Correct Answer:-Question Cancelled**

**118.** The radiations of extremely short wavelength are

- A) alpha rays
- B) beta rays
- C) gamma rays
- D) X rays
- E) ultra-violet rays

**Correct Answer :** Option C

**119.** The naturally occurring crystal which was used as a detector of radio waves is

- A) Ruby
- B) Galena
- C) silicon
- D) germanium
- E) zinc selenide

**Correct Answer :** Option B

120. If  $n_h$  and  $n_e$  represent the concentrations of holes and electrons, respectively, then in a p-type semiconductor,
- A)  $n_e = n_h$
  - B)  $n_e \gg n_h$
  - C)  $n_h \gg n_e$
  - D)  $n_e = 2n_h$
  - E)  $n_h + n_e = n_h n_e$

Correct Answer : Option C

121. 149 g of  $KCl$  is dissolved in 10 litres of an aqueous solution. The molarity of the solution is (molar mass of  $KCl = 74.5$ )
- A) 1M
  - B) 0.1M
  - C) 2 M
  - D) 0.2M
  - E) 0.002 M

Correct Answer : Option D

122. Which of the following statement is NOT true?
- A) The energies of the orbitals in the same subshell increases with increase in the atomic number
  - B) The probability density function is zero on the plane where the two lobes touch each other.
  - C) The lower the value of  $(n + l)$  for an orbital, the lower is its energy.
  - D) The total number of nodes is given by  $(n - 1)$ .
  - E) The maximum number of electrons in the shell with principal quantum number ' $n$ ' is equal to ' $n^2$ '.

Correct Answer : Option E

123. Which of the following quantum numbers determines the orientation of the orbital?
- A)  $n$
  - B)  $l$
  - C)  $m_l$
  - D)  $m_s$
  - E) both  $n$  and  $l$

Correct Answer : Option C

124. Which of the following statement is INCORRECT regarding f-block elements?
- A) The elements of the periodic table in which the last electron gets filled up in the f-orbital.
  - B) The f-block elements are from atomic number 58 to 71 and from 90 to 103.
  - C) Actinoid elements are radioactive.
  - D) There are 28 f-block elements in the periodic table.

E) The outer electronic configuration of Actinoids is  $(n - 1)f^{1 - 14}(n - 1)d^{0 - 1}ns^2$ .

**Correct Answer :** Option E

**125.** The H-C-H bond angle in ethene is

- A)  $117.6^\circ$
- B)  $121^\circ$
- C)  $110^\circ$
- D)  $105^\circ$
- E)  $119^\circ$

**Correct Answer :** Option A

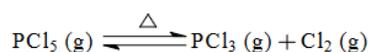
**126.** For the process to occur under adiabatic conditions, the correct condition is

- A)  $\Delta T = 0$
- B)  $\Delta P = 0$
- C)  $q = 0$
- D)  $w = 0$
- E)  $\Delta U = 0$

**Correct Answer :** Option C

For the following gas phase decomposition, the magnitude of  $\Delta H$  and  $\Delta S$  is

**127.**



- A)  $\Delta H < 0$  and  $\Delta S < 0$
- B)  $\Delta H > 0$  and  $\Delta S > 0$
- C)  $\Delta H > 0$  and  $\Delta S < 0$
- D)  $\Delta H < 0$  and  $\Delta S > 0$
- E)  $\Delta H = 0$  and  $\Delta S = 0$

**Correct Answer :** Option B

What is the value of  $K_c$  for the following equilibrium, if the value of  $K_p$  for the reaction at

**128.** 1000 K is  $8.21 \times 10^{-2}$ ? ( $R = 0.0821$ )



- A)  $10^{-3}$
- B)  $10^{-8}$
- C)  $10^{-9}$
- D)  $10^{-10}$
- E)  $10^{-5}$

**Correct Answer :** Option A

**129.** Which of the following statement is true for the effect of catalyst in equilibrium?

- A) Lowers activation energy for forward reaction only.
- B) Lowers activation energy for reverse reaction only.

- C) When  $K$  is small catalyst has greater effect.
- D) It effects to equilibrium composition of reaction mixture.
- E) Lowers activation energy for forward and reverse reaction by same amount.

**Correct Answer :** Option E

**130.** Which of the following is INCORRECT for the concept of reduction?

- A) Removal of oxygen
- B) Addition of hydrogen
- C) Addition of electron
- D) Decrease in oxidation number
- E) Removal of an electron

**Correct Answer :** Option E

**131.** The conductivity ( $k$ ) of a decinormal solution of KCl is  $0.012 \text{ ohm}^{-1} \text{ cm}^{-1}$ . The resistance of a cell containing this solution was found to be 50 ohm at 298 K. The cell constant value is

- A)  $0.02 \text{ cm}^{-1}$
- B)  $0.5 \text{ cm}^{-1}$
- C)  $0.8 \text{ cm}^{-1}$
- D)  $0.1 \text{ cm}^{-1}$
- E)  $0.6 \text{ cm}^{-1}$

**Correct Answer :** Option E

**132.** When 1 g of a non-electrolyte solute dissolved in 50 g of benzene lowered the freezing point of benzene by 0.20 K. The freezing point depression constant of benzene is  $5 \text{ K kg mol}^{-1}$ . The molar mass (g /mol) of the solute is

- A) 500
- B) 400
- C) 300
- D) 200
- E) 100

**Correct Answer :** Option A

**133.** The pre-exponential factor in the Arrhenius equation is called as

- A) probability factor
- B) activation energy
- C) collision frequency
- D) reaction coordinate
- E) frequency factor

**Correct Answer :** Option E

**134.** In a first order reaction,  $A \rightarrow \text{Products}$ , the half-life period is found to be 10 minutes. The rate of the reaction in  $\text{mol lit}^{-1} \text{ min}^{-1}$  at  $[A] = 0.1 \text{ mol lit}^{-1}$  is

- A)  $0.693 \times 10^{-3} \text{ mol lit}^{-1} \text{ min}^{-1}$
- B)  $6.93 \times 10^{-3} \text{ mol lit}^{-1} \text{ min}^{-1}$
- C)  $69.3 \times 10^{-3} \text{ mol lit}^{-1} \text{ min}^{-1}$
- D)  $693.3 \times 10^{-3} \text{ mol lit}^{-1} \text{ min}^{-1}$
- E)  $6932 \times 10^{-3} \text{ mol lit}^{-1} \text{ min}^{-1}$

**Correct Answer :** Option B

The correct statement/s about  $\text{Cr}^{2+}$  and  $\text{Mn}^{3+}$  is/are  
[Atomic numbers of Cr = 24 and Mn = 25]

135. (i)  $\text{Cr}^{2+}$  is a reducing agent  
(ii)  $\text{Mn}^{7+}$  is an oxidising agent in acidic medium  
(iii) Both  $\text{Cr}^{2+}$  and  $\text{Mn}^{3+}$  exhibit  $d^4$  electronic configuration  
(iv) The highest oxide of Mn is  $\text{Mn}_3\text{O}_4$  .  
(v)  $\text{Cr}^{2+}$  and  $\text{Mn}^{3+}$  have the same magnetic moment as both have four unpaired electrons.
- A) Only (i)
  - B) (i), (ii) and (iii)
  - C) (i), (iv) and (v)
  - D) (i) and (v) only
  - E) (i), (ii), (iii) and (v)

**Correct Answer :** Option E

136. Which of the following metal ion is diamagnetic?

- A)  $\text{Zn}^{2+}$
- B)  $\text{Ni}^{2+}$
- C)  $\text{Co}^{2+}$
- D)  $\text{Cu}^{2+}$
- E)  $\text{Mn}^{2+}$

**Correct Answer :** Option A

Match the Column-I with Column-II.

- | Column-I (Catalyst)                            | (Column-II) Used in  |
|--|--|
| (a) $\text{TiCl}_4 + \text{Al}(\text{CH}_3)_3$ | (i) Oxidation of $\text{SO}_2$ in the manufacture of $\text{H}_2\text{SO}_4$ . |
| (b) $\text{PdCl}_2$                            | (ii) Hydrogenation of fats   |
| (c) Fe   | (iii) Zeigler catalyst   |
| (d) Ni   | (iv) Wacker process  |
| (e) $\text{V}_2\text{O}_5$                     | (v) Haber process  |
- 137.
- A) (a)-(iii), (b)-(iv), (c)-(v), (d)-(ii), (e)-(i)
  - B) (a)-(ii), (b)-(iv), (c)-(v), (d)-(iii), (e)-(i)
  - C) (a)-(iii), (b)-(ii), (c)-(v), (d)-(iv), (e)-(i)
  - D) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii), (e)-(v)
  - E) (a)-(iii), (b)-(v), (c)-(iv), (d)-(ii), (e)-(i)

**Correct Answer :** Option A

138. The common oxidation state of the elements of lanthanoid series is

- A) +1
- B) +2
- C) +3
- D) +4
- E) +5

**Correct Answer :** Option C

- 139.** The complex ions  $[\text{NiCl}_4]^{2-}$  and  $[\text{Ni}(\text{CN})_4]^{2-}$  differ by
- (i) Magnetic moment
  - (ii) Geometry
  - (iii) Hybridisation of central metal ion
  - (iv) Oxidation state of nickel
- A) (i), (ii) and (iv)
  - B) (i), (ii) and (iii)
  - C) (ii), (iii) and (iv)
  - D) (ii) and (iii)
  - E) (i), (ii), (iii) and (iv)

**Correct Answer :** Option B

Four complex ions are given in Column I and the colours of light absorbed are given in Column II. Match the correct answer from the codes given below.

- | <b>140. Complex</b>                          | <b>Colour of light absorbed</b> |
|--|---------------------------------|
| (a) $[\text{Ti}(\text{H}_2\text{O})_6]^{3+}$ | (i) Blue                        |
| (b) $[\text{Cu}(\text{H}_2\text{O})_4]^{2+}$ | (ii) Yellow                     |
| (c) $[\text{CoCl}(\text{NH}_3)_5]^{2+}$      | (iii) Blue green                |
| (d) $[\text{Co}(\text{NH}_3)_6]^{3+}$        | (iv) Red                        |
- A) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)
  - B) (a)-(ii), (b)-(iv), (c)-(iii), (d)-(i)
  - C) (a)-(iii), (b)-(ii), (c)-(iv), (d)-(i)
  - D) (a)-(i), (b)-(iv), (c)-(ii), (d)-(iii)
  - E) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)

**Correct Answer :** Option A

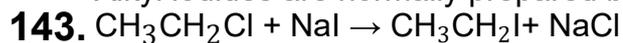
- 141.** The number of  $\alpha$  -hydrogens in tertiary butyl chloride, isopropyl chloride, ethyl chloride and methyl chloride are respectively
- A) 0, 1, 2 and 3
  - B) 0, 3, 6 and 9
  - C) 1, 3, 6 and 9
  - D) 9, 6, 3 and 0
  - E) 3, 6, 9 and 12

**Correct Answer :** Option A

- 142.** The correct order of the rate of  $\beta$ -elimination reaction among the alkyl halides is
- A) Secondary > Tertiary > Primary
  - B) Tertiary > Primary > Secondary
  - C) Tertiary > Secondary > Primary
  - D) Primary > Tertiary > Secondary
  - E) Primary > Secondary > Tertiary

**Correct Answer :** Option C

Alkyl iodides are normally prepared by the following reaction:

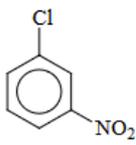
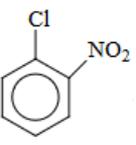
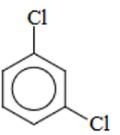
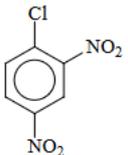


This reaction is known as

- A) Wurtz reaction
- B) Wurtz-Fittig reaction
- C) Williamson synthesis
- D) Finkelstein reaction
- E) Etard reaction

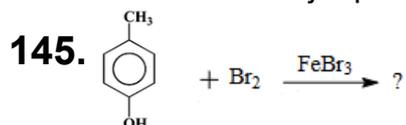
**Correct Answer :** Option D

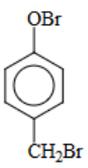
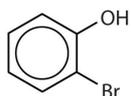
**144.** Which of the following is most reactive towards nucleophilic aromatic substitution?

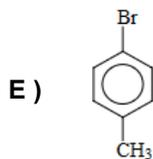
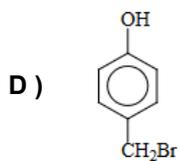
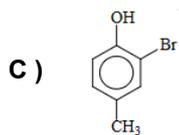
- A) 
- B) 
- C) 
- D) 
- E) 

**Correct Answer :** Option E

What is the major product of the following reaction?



- A) 
- B) 



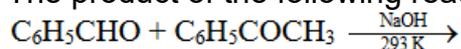
**Correct Answer :** Option C

**146.** Benzophenone and Acetophenone are distinguished by treating with

- A) Fehling's reagent
- B) Lucas reagent
- C) Iodine and alkali
- D) Aqueous  $\text{CrO}_3$
- E) Tollens' reagent

**Correct Answer :** Option C

**147.** The product of the following reaction is



- A)  $\text{C}_6\text{H}_5\text{CH}=\text{CHCOC}_6\text{H}_5$
- B)  $\text{C}_6\text{H}_5\text{COCH}_2\text{C}_6\text{H}_5$
- C)  $\text{C}_6\text{H}_5\text{CH}=\text{CHC}_6\text{H}_5$
- D)  $\text{C}_6\text{H}_5\text{CH}(\text{OH})\text{COC}_6\text{H}_5$
- E)  $\text{C}_6\text{H}_5\text{COCOC}_6\text{H}_5$

**Correct Answer :** Option A

**148.** Which of the following is the strongest acid?

- A)  $\text{FCH}_2\text{COOH}$
- B)  $\text{CF}_3\text{COOH}$
- C)  $\text{NC-CH}_2\text{COOH}$
- D)  $\text{Br-CH}_2\text{COOH}$
- E)  $\text{CH}_3\text{COOH}$

**Correct Answer :** Option B

Choose the correct combinations for the column I with column II.

**Column-I**

**Column-II**

- 149.**
- |   |                                   |
|---|-----------------------------------|
| (a) Benzenesulphonyl chloride                 | (i) Carbylamine reaction          |
| (b) Conversion of amide to amine              | (ii) Secondary amine              |
| (c) Conversion of primary amine to isocyanide | (iii) Hinsberg's reagent          |
| (d) Diethylamine                              | (iv) Hofmann's bromamide reaction |

- A) (a)-(ii), (b)-(iv), (c)-(i), (d)-(iii)
- B) (a)-(i), (b)-(ii), (c)-(iii), (d)-(iv)
- C) (a)-(iii), (b)-(iv), (c)-(i), (d)-(ii)
- D) (a)-(i), (b)-(iii), (c)-(ii), (d)-(iv)
- E) (a)-(iii), (b)-(iv), (c)-(ii), (d)-(i)

**Correct Answer :** Option C

**150.** Peptide on hydrolysis gives

- A) glucose
- B) fatty acids
- C) amino acids
- D) ribose sugar,  $\text{H}_3\text{PO}_4$  and base
- E) heterocyclic base and sugar

**Correct Answer :** Option C